

REMARKS

Reconsideration and allowance of the present patent application based on the foregoing amendments and following remarks are respectfully requested.

By this Amendment, claims 1, 3-5, 7-9, 17-19, 21-23, 28 and 31-32 are amended. Support for the amendment to the claims may be found throughout the specification. No new matter has been added. After entry of this Amendment, claims 1, 3-5, 7-9, 17-19, 21-23, 28 and 31-32 will remain pending in the patent application.

Entry of this Amendment is proper under 37 C.F.R. §1.116 as the amendments: (a) place the application in condition for allowance for the reasons discussed herein; (b) do not present any new issues that would require further consideration and/or search as the amendments merely amplify issues discussed throughout the prosecution; (c) do not present any additional claims without canceling a corresponding number of claims; and (d) place the application in better form for appeal, should an appeal be necessary. Entry of this Amendment is thus respectfully requested.

Claims 1, 3-5, 7-9, 17-19, 21-23, 28 and 31-32 were rejected under 35 U.S.C. §112, second paragraph. The rejection is respectfully traversed.

In connection with the rejection of claim 1, the Examiner indicated that the method “of cleaning for removing” is indefinite and a confusing term. While Applicants respectfully disagree with this determination, the claims are amended to positively recite that the claims are directed to a method of cleaning an interior of an apparatus to remove a metal film formed on an inner wall of the treatment apparatus. This amendment is fully supported by the original disclosure. Applicant respectfully submits that one skilled in the art could make or use the invention from the disclosures in the patent coupled with information known in the art without undue experimentation. (See MPEP 2164.01). As such, Applicants respectfully submit that the amendments to the claims obviate the rejection.

With respect to the rejection of claim 21, Applicants have amended this claim to delete the languages “the material”, “reacting the copper” and “the copper complex”. Accordingly, Applicants respectfully submit that the amendments to claim 21 obviate the rejection of this claim.

Accordingly, reconsideration and withdrawal of the rejection of claims 1, 3-5, 7-9, 17-19, 21-23, 28 and 31-32 under 35 U.S.C. §112, second paragraph are respectfully requested.

Claims 1, 3-5, 7-9, 17-19, 21-23, 28 and 31-32 were rejected under 35 U.S.C. §112, first paragraph. The rejection is respectfully traversed.

In connection with the rejection, the Examiner indicated that the specification, as filed, does not provide support for “reducing a pressure in the chamber, the third pipe and the vaporizer” as claimed in claim 1. In response, claim 1 is amended to change the recitation “reducing a pressure in the chamber, the third pipe and the vaporizer” to “reducing a pressure in the chamber.” This Amendment obviates the rejection of the claims. Accordingly, reconsideration and withdrawal of the rejection of claims 1, 3-5, 7-9, 17-19, 21-23, 28 and 31-32 under 35 U.S.C. §112, first paragraph, are respectfully requested.

In view of the foregoing claim amendments, Applicants respectfully submit that the rejections of the claims under 35 U.S.C. 112, first and second paragraphs are overcome. A notice to that effect is earnestly solicited in the next communication from the Office.

Claims 1, 3-9, 17-19 and 21-30 were rejected under 35 U.S.C. §103(a) based on Nguyen *et al.* (U.S. 2001/0009154 A1) (hereinafter “Nguyen”) in view of Ivankovits *et al.* (U.S. Pat. No. 5,213,621) (hereinafter “Ivankovits”) and Senzaki *et al.* (U.S. Pat. No. 6,090,960) (hereinafter “Senzaki”). The rejection is respectfully traversed.

Claim 1 recites a method of cleaning a metal film formed inside a treatment apparatus that is configured to form a metal film on a substrate, the treatment apparatus comprising (a) a first source supplying a treatment agent; (b) a second source supplying a cleaning agent comprising one of a carboxylic acid and a derivative of a carboxylic acid; (c) a vaporizer vaporizing the treatment agent and the cleaning agent; (d) a first pipe connecting the first source and the vaporizer, and supplying the treatment agent from the first source to the vaporizer; (e) a second pipe connecting the second source and the vaporizer, and supplying the cleaning agent from the second source to the vaporizer; (f) a chamber for forming the metal film on a substrate; (g) a susceptor mounting the substrate in the chamber; (h) a third pipe connecting the vaporizer and the chamber, and supplying the vaporized treatment agent or the vaporized cleaning agent from the vaporizer to the chamber; (i) a vacuum pump exhausting the chamber; and (j) a heat source heating the vaporizer, the third pipe, and the chamber, the method comprising, *inter alia*, (ii) reducing a pressure in the chamber; (iii) heating the vaporizer, the third pipe, and the chamber by the heat source over a predetermined temperature; (iv) supplying the cleaning agent comprising one of the carboxylic acid and the derivative from the second source to the vaporizer through the second pipe to vaporize the cleaning agent; and (v) supplying the vaporized cleaning agent from the vaporizer into the chamber through the third pipe.

As explained in Applicants' Amendment of December 14, 2005, neither Nguyen, Ivankovits nor Senzaki discloses, teaches or suggests an apparatus that includes the specific arrangement of the first source, the second source, the vaporizer and the pipes, as recited in claim 1. As such, these references, taken alone or in combination cannot teach or suggest a method including, *inter alia*, "heating the vaporizer, the third pipe, and the chamber by the heat source over a predetermined temperature; (iv) supplying the cleaning agent comprising one of the carboxylic acid and the derivative from the second source to the vaporizer through the second pipe to vaporize the cleaning agent; (v) supplying the vaporized cleaning agent from the vaporizer into the chamber through the third pipe", as recited in claim 1.

In response to Applicants' Amendment of December 14, 2005, the Examiner indicated that "Applicant's argument with respect to Nguyen is unpersuasive, because the process as claimed does not exclude oxidizing the surface to be cleaned." The Examiner also indicated, with respect to Nguyen and Ivankovits, that "in both references, the interior of the chamber will be cleaned during cleaning the substrate." However, these arguments are meritless as they fail to address Applicants' points presented in the Amendment of December 14, 2005. In particular, the Examiner has failed to point out where Nguyen, Ivankovits and/or Senzaki disclose, teach or suggest heating the vaporizer, the third pipe, and the chamber by the heat source over a predetermined temperature; (iv) supplying the cleaning agent comprising one of the carboxylic acid and the derivative from the second source to the vaporizer through the second pipe to vaporize the cleaning agent; (v) supplying the vaporized cleaning agent from the vaporizer into the chamber through the third pipe.

Applicants respectfully submit that in order "to establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations." (See MPEP 2142, emphasis added). Because Nguyen, Ivankovits and Senzaki are silent as to (iii) heating the vaporizer, the third pipe, and the chamber by the heat source over a predetermined temperature; (iv) supplying the cleaning agent comprising one of the carboxylic acid and the derivative from the second source to the vaporizer through the second pipe to vaporize the cleaning agent; and (v) supplying the vaporized cleaning agent from the vaporizer into the chamber through the third pipe, the rejection of claim 1 must be withdrawn.

As explained in Applicants' Amendment of December 14, 2005, Nguyen discloses a method of cleaning interior surfaces of a metal vapor deposition chamber by oxidizing the surface to be cleaned with oxygen plasma and then removing the oxide products by using hydrolyzed hexafluoroacetylacetone (Hhfac) to volatilize the oxide products. (See, e.g., FIG. 2 of Nguyen). Nguyen also discloses introducing an oxygen gas into the chamber to promote oxidation of the surfaces to be cleaned. (See paragraph [0040] of Nguyen). The chamber of Nguyen includes a chuck 24, a pump 22 and an inlet port 14 in communication with a shower head 16. (See, e.g., FIG. 1 of Nguyen). Nguyen is, however, silent as to an apparatus that includes a first source, a second source, a first, second and third pipe, a vaporizer and a heat source, as in claim 1. As a result, Nguyen cannot disclose (iii) heating the vaporizer, the third pipe, and the chamber by the heat source over a predetermined temperature; (iv) supplying the cleaning agent comprising one of the carboxylic acid and the derivative from the second source to the vaporizer through the second pipe to vaporize the cleaning agent; or (v) supplying the vaporized cleaning agent from the vaporizer into the chamber through the third pipe.

Ivankovits fails to remedy the deficiencies of Nguyen. Ivankovits merely discloses a process for cleaning metal-containing contaminants from a surface of a substrate of the type used in fabricating integrated circuits and semiconductors by using a cleaning agent, for example trifluoroacetic acid. (See, e.g., col. 2, lines 37-67 and col. 4, lines 9-25 of Ivankovits). However, Ivankovits does not provide any teachings as to heating the third pipe and the vaporizer, supplying the cleaning agent from the second source to the vaporizer and supplying the vaporized cleaning agent from the vaporizer into the chamber through the third pipe. Ivankovits does not even hint at an apparatus including a first source, a second source, a first, second and third pipe, a vaporizer and a heat source, as in claim 1.

Similarly, Senzaki fails to remedy the deficiencies of Nguyen and Ivankovits. The Examiner relied on Senzaki as allegedly teaching the vaporizer and the pipes of claim 1. However, Senzaki is not concerned with cleaning a metal inside the chamber. Rather, Senzaki merely teaches providing a treatment agent (Cu) to a vaporizer and then delivering the vaporized agent to the chamber to form a metal film on a substrate. There is no teaching or suggestion anywhere in Senzaki to "supply a cleaning agent comprising one of the carboxylic acid and the derivative from the second source to the vaporizer through the second pipe to vaporize the cleaning agent." For at least this reason, any reasonable combination of Nguyen, Ivankovits and Senzaki cannot result, in any way, in the invention of claim 1.

Furthermore, Senzaki is completely silent as to heating the pipe 72 (which most closely corresponds to the third pipe of claim 1) that extends from the vaporizer 68 to the chamber 60. The Examiner alleged that this feature is inherent. Applicants respectfully disagree and point out that "in relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristics necessarily flow from the teachings of the applied prior art." (See MPEP 2112 citing Ex Parte Levy, 17 U.S.P.Q. 2d 1461, 1464 (Bd. Pat. App. & Inter. 1990)). All that is disclosed in Senzaki is that the vaporizer 68 vaporizes the Cu agent at a temperature in a range between 40°C and 80°C and that the Cu agent is then supplied to the chamber via the shower head 74 at a temperature in a range between 40°C and 80°C. From these teachings, one cannot conclude that the pipe 72 must be heated. Therefore, in the absence of such a teaching, the combination of Nguyen, Ivankovits and Senzaki cannot result, in any way, in the invention of claim 1.

Accordingly, any reasonable combination of Nguyen, Ivankovits and Senzaki cannot result, in any way, in the invention of claim 1. Therefore, Applicants respectfully submit that claim 1 is patentable over Nguyen, Ivankovits and Senzaki and a combination thereof.

Claims 3-5, 7-9, 17-19, 21-23, 28 and 31-32 are patentable over Nguyen, Ivankovits and Senzaki and a combination thereof at least by virtue of their dependency from claim 1 and for the additional features recited therein.

Accordingly, reconsideration and withdrawal of the rejection of claims 1, 3-5, 7-9, 17-19, 21-23, 28 and 31-32 under 35 U.S.C. §103(a) based on Nguyen in view of Ivankovits and Senzaki are respectfully requested.

Applicants have addressed the Examiner's rejection and respectfully submit that the application is in condition for allowance. A notice to that effect is earnestly solicited.

If any point remains in issue which the Examiner feels may be best resolved through a personal or telephone interview, please contact the undersigned at the telephone number listed below.

Please charge any fees associated with the submission of this paper to Deposit Account Number 033975. The Commissioner for Patents is also authorized to credit any over payments to the above-referenced Deposit Account.

Respectfully submitted,

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